GEOGRAPHIC SCHOOL BULLETINS

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Photograph by the Archbold Expeditions

EVEN REMOTE NEW GUINEA SEES POLITICAL CHANGES

The airplane has carried the white man and the camera into the hitherto unexplored mountainous interior of New Guinea, where this native warrior was photographed in his costume of fur, feathers, and shells. Aviation also decided the site of its new capital, the port of Lae (Bulletin No. 5).

HOW TEACHERS MAY OBTAIN THE BULLETINS

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Russia's Ukraine Holds Grain and Mineral Riches

THE German drive through the Ukraine paralyzes Russia's left arm. This vital region includes the cultural and manufacturing center of Kiev, the third largest city in the U.S.S.R.; the core of industries around the Dneprostroy Dam, the world's second largest hydroelectric project; and the industrial cluster of the Donets Basin.

The Ukraine, in the southwestern corner of Russia, is one of the eleven main republics (often called the "Constituent Republics") that make up the U.S.S.R. (Union of Soviet Socialist Republics). Its people, noted for their colorful folk songs and costumes and rich old culture, number more than 40 million—equal to nearly a third of the population of the United States. It has an area now of about 220,000 square miles, greater than that of all Germany in 1937.

Both Bread Basket and Sugar Bowl, with Choice of Vegetable or Fruit Salad

In this extensive Ukrainian area, often called "Little Russia," are included parts of Poland and Romania acquired since 1939 (illustration, next page).

The majority of Ukrainians earn their livelihood from the soil, living in white-washed cottages topped by high thatched roofs. This region was long known as the Russian bread basket. It might be called also Russia's sugar bowl.

Across the Ukraine spreads a wide belt of good "black earth," like that of central Texas. Extending generally from southwest to northeast, it produces about three-fourths of the Union's sugar beets, one-third of its barley, one-fourth of its American-type corn, and more than one-fifth of its wheat.

The southern Ukraine grows cucumbers, melons, potatoes, pumpkins, squash, and other vegetables. Thriving orchards yield pears, plums, apples, and cherries.

Some 40 per cent of the Union's eggs, it is estimated, come from Ukrainian barnyards; and the region holds nearly a quarter of the nation's livestock.

Like Northern Sections of American West

Rolling away toward distant horizons, vast flat fields of the Ukraine are given over to grasses from which hay is made. Some of these grasses grow from ten to 20 feet high. The tumbleweed serves as a fuel. Hemp, growing 20 feet high, is made into rope and coarse cloth. The sunflower plants of the Ukraine are valuable as fodder and for the oil pressed from their seeds. Even cotton, formerly raised chiefly in the regions of Central Asia, is now reported to be thriving on more than half a million acres in the Black Sea areas of the Ukraine.

Climate in the Soviet Ukraine is extremely cold in winter, scorching in summer. Weather there is much like that in northern sections of the American prairie West, whose flat and gently rolling open spaces the Soviet region resembles.

Farming in the Soviet Ukraine has been considerably "stepped up" in recent years by an increased use of farm machinery. In 1939, some 90,000 tractors and 29,000 harvesters were reported at work in the fields. The first tractor stations of the Union were set up there. According to Soviet authorities, more than 95 per cent of all the peasant householders are now united for "collective farming."

Although a farm region, the Ukraine has tremendous peacetime mining and manufacturing industries. Producing three-quarters of the Soviet Union's coal and more than half of its iron and steel, it is the southern center of Russian heavy industry. Of all Russian farm machinery, 70 per cent is made in the Ukraine.

UMI

Photograph by J. Perestrello

JUDGING BY THE TREES, THE CITY OF LAS PALMAS SHOULD CHANGE ITS NAME TO LAS BANANAS

Palm trees on the skyline are outnumbered by the banana trees in the foreground, for banana plantations crowd around the suburbs. But ignoring the hint of its own landscape, this capital city of Spain's Canary Islands has recently announced the changing of its name from Las Palmas to Las Palmas de Gran Canaria (Bulletin No. 5).

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The Aurora Borealis Drops Some of Its Mystery

WHAT is the aurora borealis, the display of icy-white beams and fluttering colors that spread over the heavens and mystified millions of Americans on the evening and night of September 18?

Auroras, or northern lights as they frequently are called, went unexplained by science until relatively recent times. Thousands of persons still believe them to be the reflection of sunlight from polar snows. Even now physicists do not think that they know the complete story. But developments in several sciences have helped toward a solution.

Information from Other Fields Helped

Among those developments are a better understanding of gases, the building of better telescopes and photographic equipment that have brought new information about the sun, an increased knowledge of electricity and earth magnetism, and even the spread of radio. A theory has emerged which is now pretty generally held by scientists.

The theory, briefly, is this:

Sun spots, which in reality are "whirlwinds" in the sun's white-hot gases, develop from time to time (illustration, next page). From the craters that these rapidly spinning storms form, tiny particles are hurled outward.

The craters are carried along by the rotation of the sun on its axis as mountains are carried by the earth. On a smaller scale, the turning of the sun spots through space can be compared to the change in aiming the great guns on a battleship, as the turret in which they are fixed turns.

Electrified Particles Bombard the Earth

As the sun rotates, a sun spot's crater may come to point toward the earth. If at that time it "shoots" a bundle or stream of electrified particles with sufficient force to reach the earth's atmosphere, the particles, it is believed, cause auroras.

Before the invisible particles arrive, our planet is spinning away on its usual routine, half bathed in sunlight, half in the shadow of night. Surrounding the earth, and rotating with it, is the vast ocean of atmosphere, or air. The air is relatively "thick" near the earth's surface, but away from the solid earth it rapidly grows thinner. At a point five or six hundred miles or more up, near the "edge" of the atmosphere, it is so thin that it approaches a vacuum.

There is something else invisible that surrounds the earth and plays a part in the drama of auroras. It is the earth's "magnetic field," the forces that make the compass needle point approximately toward the north and south. It reaches out even farther than the air.

Ordinary sunlight, traveling 186,000 miles a second, makes the 93-million-mile trip from the sun to the earth in about 8 minutes. But the electrified particles that are believed to cause auroras move much more slowly. According to weight, they have speeds of about 400 to 1,400 miles per second, and require from 18 to 60 hours to reach the earth's atmosphere.

When they arrive, they cause a tremendous disturbance in the usually well-ordered upper air. They change the normal magnetic field of the earth, moving compass needles from their usual channels. They disrupt the higher "radio ceilings" so that short waves "get lost" and are not turned back earthward to receiving sets.

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Iron and manganese and coal, mined close together, are the basis of this industrial development. Krivoi Rog is the iron industry capital. Coal for the smelters, rolling mills, locomotives, and factories of all south Russia comes from the broad Donets Coal Basin north of Rostov.

Russia produces more manganese (vital in hardening steel) than she can use: 35 per cent of United States managanese imports normally come from Russia. Great deposits of this metal lie a few miles southeast of the iron center, Krivoi Rog. Ukraine sources, plus deposits in the Caucasus, have provided a third of the world's supply of manganese.

Coal is south Russia's biggest power-maker. But the huge hydroelectric Dneprostroy Dam on the Dnieper River near Zaporozhe contributed more than half a million kilowatts of electricity. The dam was destroyed by dynamite by retreating Russians, in August.

Note: The National Geographic Society's Map of Europe and the Near East shows the Ukraine in some detail, with the Polish Ukrainian regions added but the Romanian sections delineated separately. Copies of the Map may be obtained on paper or linen from the headquarters of the Society in Washington, D. C.

Bulletin No. 1, October 13, 1941.

Photograph by Dorothy Hosmer

THE UKRAINE ONCE LAPPED OVER INTO POLAND

The level stretches of the rich Ukrainian plain were formerly cut on the west by the Russo-Polish frontier, and the adjoining corner of Poland had its quota of Ukrainians, known by their distinctive costumes and speech, as well as their traditional music. When Germany in 1939 moved into western Poland, Russian troops occupied the eastern part, and added the Polish Ukrainians to the U.S.S.R. The seated Ukrainian peddler in sleeveless jacket and leather sandals was photographed in Kolomyja, Poland. For a traveling bag he carries a leather pouch studded with metal ornaments, slung over his shoulder.

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Brazil's Airports for Transatlantic Plane Ferrying

ANNOUNCEMENT of warplane ferrying service from North America to West Africa by way of South America came shortly after President Vargas authorized improvement of airport facilities at eight seaboard cities in Brazil. These ports are evenly spaced from north of the Amazon River southward around Brazil's "bulge." The new airfields will receive land planes where seaplanes have operated almost exclusively.

Of the eight cities selected for the new and expanded air terminal development, five have double names: Salvador (Bahia), Recife (Pernambuco), Fortaleza (Ceará), Belém (Pará), and Montenegro (Amapá). The others are Maceió, Natal, and São Luiz do Maranhão. All of the cities except Montenegro are capitals of States of Brazil.

Only 1,820 miles of the South Atlantic separate Natal from Freetown in Sierra Leone, suggested as one African terminus for the ferrying service. Strategic Dakar is only 1,870 miles from Natal. For some time American pilots have been flying military planes as far as Recife (Pernambuco), the most easterly Brazilian city.

SALVADOR (Bahia). On the Bay of All Saints about 740 miles north of Rio de Janeiro, Salvador is Brazil's third port and fourth largest city, with more than 510,000 people. It ships much of the cocoa of Brazil, the second ranking cacao-producing country in the world. Other exports are coffee, rubber, tobacco, cigars, and cigarettes. Better known as Bahia, Salvador is Brazil's oldest city and for 250 years was its capital. From there the United States obtained the original seedless orange trees.

MACEIÓ. This city of 144,000 people lies 270 miles north of Salvador. Its lighthouse stands on a hill in midtown, fully a half-mile from the sea. From Jaraguá, Maceió's seaport, cotton and sugar are shipped. Its industries include cotton mills, cigarette factories, and sugar refineries.

RECIFE (Pernambuco). The city's old name of Pernambuco is generally more familiar. At the most easterly point in South America, Recife is usually the first port of call in that continent for westward-bound transatlantic sea traffic. This most important city of north Brazil and third largest metropolis of the republic has wide streets, tall modern buildings, and good highways into the hinterland. Sugar, cotton, and coffee industries support many of its 530,000 people and are the chief exports. Recife is a Brazilian naval base.

NATAL. This city has become familiar as the South American port of arrival of transatlantic air lines from Europe and Africa. Its already large airport lies some eight miles from the town. Natal (population, 56,000) has rail connections with Recife and Maceió. Cotton and salt are the chief commodities.

FORTALEZA (Ceará). Ships discharge their cargoes in lighters from the open roadstead of this port, 550 miles northwest of Recife on the north coast of the "bulge" of Brazil. New port works are under construction five miles east of Fortaleza at Mucuripe Point. Its population is 154,000.

SÃO LUIZ DO MARANHÃO. More than half-way from the "bulge" to the Amazon River's mouth, São Luiz is a well-sheltered port built on an island. Cotton manufacturing, oil-nut pressing, and sugar refining occupy many of its 66,000 inhabitants. Its old and cultural traditions have won São Luiz the name of "the Brazilian Athens" (illustration, next page).

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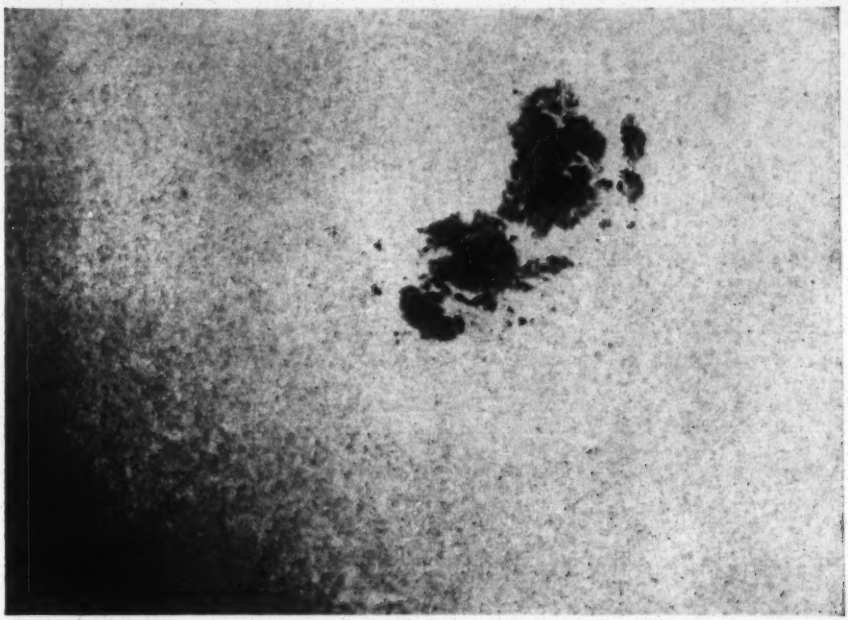
The particles themselves, while still above the atmosphere, are pulled by the earth's magnetism toward the north and south magnetic poles. When they finally strike into the gases of the air they are over the northern and southern parts of the earth. There are countless collisions of the sun-born particles with molecules of the air gases. As a result the gas molecules are "agitated" or set to vibrating so that they glow, showing forth the beautiful lights of the aurora, probably from 40 to several hundred miles above the earth. Very roughly, this can be compared to what takes place in the tube of a neon or fluorescent light when an electric current passes through.

This general theory of the aurora gained much support from the occurrences in mid-September. An unusually large group of spots was photographed on the sun, day after day, for nearly a week before the appearance of the aurora. The spot area was turning steadily toward the earth. Some of the largest of the spots crossed the sun's meridian—almost exactly faced the earth—on the morning of the 17th. About 18 hours later, on the morning of the 18th, the greatest change in the earth's magnetism was recorded. Thirty hours after the spots crossed the meridian, and for several hours afterward, the sky was lighted by the great aurora.

For three years the National Geographic Society and Cornell University have been cooperating in a painstaking study of auroras, observing them by means of spectrographs, recording the varying forms by photography, and taking other pictures at the same instant from the ends of a 200-mile base-line. Later these photographs will be used in calculating the exact heights above the earth of the glowing gases of various displays, and in checking through magnetic and radio records for facts about auroras still unknown.

Note: For other discussions of the aurora and sun spots, see "Mystery of Auroras," in the *National Geographic Magazine*, May, 1939, and "The Solar System's Eternal Show," July, 1939.

Bulletin No. 2, October 13, 1941.



Photograph courtesy Carnegie Institution of Washington

SUN SPOTS ARE MUZZLES OF SOLAR GUNS THAT BOMBARD THE EARTH

The sun, which is the star that is nearest to the earth, makes its moods felt within the earth's atmosphere in many ways, though 93 million miles away. Occurrence of the violent whirling storms known to observers as sun spots may be accompanied on the earth by magnetic upsets, radio "black-outs," and displays of the aurora borealis.

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Centuries of Fire Have Changed Building Materials

THE observance of Fire Prevention Week throughout the nation recently focused attention on the centuries of progress toward more fire-resistant building materials.

Ancient Greece's contribution to architecture would have been lost if it had not been transcribed early to stone. The characteristic colonnades of Grecian building trace back to a primitive period when the columns were tree trunks, but only the later stone columns survived as examples to architects of ages to come.

Housebreakers Really "Broke Houses" Then

The sun-dried brick walls of the 5th century B.C. were reinforced with timber. Flat roofs rested on wooden beams, and were made of clay trussed with brushwood. There were real housebreakers in those days; the Greek word for burglar signified one who dug through a wall.

Terracotta facings go back to days of wood construction. Excavations at Mycenae revealed walls with lower portions of stone, surmounted by mud-brick and timber, similar to Tudor construction in England.

Rome's first homes were probably circular huts with wickerwork walls and thatched roofs. A durable concrete of lime and volcanic dust was developed soon. Early bricks were thin and triangular, with one angle pointing in. Much stone was later used. However, Rome suffered many fires, notably that under Nero in 64 A.D. Following that fire, Rome was rebuilt with wider streets and lower buildings.

London's Long Battle Against Fire

England had no stone buildings until 680 A.D., when it is recorded, an abbot imported stone masons and glaziers. Little change resulted. In 974 King Edgar complained that the great monasteries throughout the country were of worm-eaten and rotten timber.

Because of the many fires in London, the Lord Mayor in 1189 decreed that all houses thenceforth should be built of stone. So they were, until increasing congestion within London's walls started extensive new housing projects, many of them in wood.

In September, 1666, the great London fire brought back stone and brick. A pioneer fire insurance office opened. Queen Anne decreed in 1708 that each parish in England must provide two engines, ladders and fire-fighting brigades. Until the advent of steam, fire engines were modeled on a Netherlands invention of 1670. It was provided with flexible hose and powered like a railway hand-car by a see-sawing rack that was pumped up and down. The engines increased in size until rows of 25 to 30 men were thus bowing to each other on opposite sides. Now the most modern equipment is used by London firemen, who find that their own "firing line" is one of the front lines of the present war (illustration, next page).

Houses of Iron

Two centuries ago, Benjamin Franklin praised Paris for building stone houses "in a manner more secure from danger of fire." Paris and other European cities were helped in their efforts for fireproof construction by nearby supplies of soft and easily worked stone; it cut like cheese and hardened on exposure.

An early experiment to use fire-defying metal for building was made at Wid-

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BELÉM (Pará). In the days of Brazil's rubber boom, Pará was world renowned. This great port and naval base of the lower Amazon (population 309,000) is one of South America's handsomest cities. It stands not far south of the Equator and 90 miles from the open sea. An old cathedral, a huge white marble theater, spacious squares, shady boulevards, and fine buildings distinguish this busy commercial city, which carries on a large trade in rubber, cacao, nuts, and timber. In winter Belém is the Brazilian terminus of the westward-bound United States transatlantic plane service.

MONTENEGRO (Amapá). A small town situated on the Brazilian coast about 100 miles north of the Amazon River mouth, Montenegro takes its variant name from the Amapá Grande River close by. It is situated near the Ilha de Maracá.

Note: For a view of life in Brazil, see "Cotton: Foremost Fiber of the World," in the *National Geographic Magazine*, February, 1941; "Carioca Carnival," September, 1939; "As São Paulo Grows," May, 1939; "Through Brazil to the Summit of Mount Roraima," November, 1930; and "Gigantic Brazil and Its Glittering Capital," December, 1930.

See also GEOGRAPHIC SCHOOL BULLETINS for November 29, 1937, for the article: "Brazil Sets Up First Corporate State in New World."

The location and surroundings of these new airport cities may be found on the Society's Map of South America, which may be obtained from the Washington, D. C., headquarters.

Bulletin No. 3, October 13, 1941.

Photograph by Capt. A. W. Stevens

SÃO LUIZ DO MARANHÃO, A CITY HALF AT SEA, SPEEDS LAND PLANES SEAWARD

The flat country surrounding the island on which the city stands offers few obstructions to planes. For miles around, slow rivers and lakes drain into the broad bays around the island, and coastal shipping finds spacious harbors. At low tide the shallow waters reveal mud flats on all sides of the big Brazilian port. The abundant foliage and the clusters of palm trees along the water front hint of the city's nearness to the Equator. Because of São Luiz's situation, it is a convenient stop-over point on the route of warplanes being ferried from North America across the South Atlantic to Africa.

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Geo-Graphic Brevities

LAS PALMAS, CANARY ISLAND PORT, GETS NEW NAME

IN THIS day of brevity and short cuts for the sake of speed, Las Palmas, on Canary Island, exchanges its short name for the longer one of Las Palmas de Gran Canaria, or The Palms of The Grand Canary.

This port last December was made a military base for Spain's Canary Islands. At that time there was speculation as to its possible use as a German submarine base to harry British shipping.

With the war's realignment of shipping lanes, the port of Las Palmas de Gran Canaria has assumed increasing importance for it lies about 100 miles off the African coast. The city, with 100,000 inhabitants, is the largest in the Canary Islands (illustration, inside cover).

Las Palmas offers a well-protected haven for the largest ships, and has long been an important coaling station. On the north side the harbor is protected by a promontory formed by a small group of volcanoes rising sharply out of the sea.

The coaling of ships was a British monopoly. Normally 4,000 ships visit the port in a year. While the port is used mostly by ships in transit, there is increasing traffic in the Canaries in the export of bananas, tomatoes and potatoes.

* * * * *

CAMBODIA, ASIATIC JUNGLE LAND, HAS BACHELOR RULER

A NEW monarch occupies the throne of Cambodia, the troubled protectorate in French Indo-China, where old temples (illustration, next page), gilded pagodas and good roads form strange combinations of past and present. Prince Sisowath, a Cambodian bachelor who once served in the French Army, was named king following the death of his father, Sisowath Monivong, a short time after Cambodia lost a slice of territory to adjacent Thailand (Siam).

Both France and Japan are exerting their power over the protectorate.

The native king holds his court in Pnom-Penh, colorful Cambodian capital on the hills overlooking the Mekong River, life artery of southeast Asia. Outside, the royal palace is unpretentious, but within are such treasures as a life-sized golden Buddha studded with diamonds. Once the palace swarmed with dancing girls whose classical ballets were world-renowned, but in 1938 the depression forced King Sisowath Monivong to "fire" all but about 100 of them.

* * * * *

AIRLINE CENTER FOR GOLD FIELDS PICKED AS NEW GUINEA'S CAPITAL

THE recent choice of Lae, a coastal airline terminal, as the new capital of the Mandated Territory of New Guinea is a testimonial to aviation's unique role in developing the island's rich gold deposits.

Rabaul, the old capital, is being abandoned because volcanic activity has menaced that picturesque tropical community in the southwest Pacific since 1937. It is situated on New Guinea's neighboring island of New Britain.

Lae, at the head of a gulf on New Guinea's eastern coast, is headquarters of the aviation company which made possible the opening of the Morobe gold fields in the little-explored, mountainous interior. Once the only way to get to the gold country was by foot through the hazards of dense jungle, poisonous snakes and insects, and savage natives. Now mining supplies, even heavy machinery, are

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more, Kent, ten miles from London, where two houses were built of iron in the earlier half of the past century. Lacking insulation, they proved too hot in summer and too cold in winter, and were pulled down in 1887.

About that time annual fire losses in the United States were running between $100,000,000 and $130,000,000 a year. This stirred fire insurance companies to greater activity in building inspection and the promotion of "slow-burning construction." Fire prevention advanced as science and industry developed greater fire-resistance in building materials.

Note: For further discussion of fire and fire prevention methods, see "New York—An Empire within a Republic," in the *National Geographic Magazine*, November, 1933, and "Washington, the Evergreen State," in the February, 1933 issue.

See also: GEOGRAPHIC SCHOOL BULLETINS for October 5, 1936, containing the bulletin, "Fire! Fire!—Can the Cry Die Down?"

Bulletin No. 4, October 13, 1941.

Photograph from British Combine

LONDON'S DESTRUCTIVE FIRES HAVE HELPED BUILD A STATELY CITY

Old records show that since 1189 A.D. the fires in London have stimulated the city fathers to construct their more important buildings of fire-resistant materials. It was after the Great Fire of 1666 that Sir Christopher Wren contributed the dozens of graceful stone churches and other structures for which he is renowned. During the past year incendiary bombs caused destruction which may be replaced by new architectural gems for the future.

carried in by planes, which on return trips bring to the coast millions of dollars worth of gold annually.

Situated near the mouth of the Markham River, Lae has a natural landing field and therefore was chosen as the site of New Guinea's first coastal airdrome. The principal buildings now are the hangars, workshops, and staff offices of the airline company. A store and a hotel also have been erected.

* * * * *

DALMATIA SHIFTS TO ITALY

A GOOD portion of the Dalmatian coast—the price asked by Italy for joining the Allies during the first World War—is now reported annexed to Italy under Axis agreement.

The name Dalmatia is now somewhat generally applied to the entire coast of Yugoslavia. It originally applied more to the southern portion. This ragged coast has many indentations and some good harbors, and is bordered by several hundred islands. Their areas vary from Krk's 270 square miles downward, and, with their tortuous channels, once afforded refuge to pirates preying on Adriatic shipping.

History indicates Dalmatia has been prized more for its control of the Adriatic Sea than for any value in the land itself, and this is the reason assigned for Italy's demands. Its location made it highly desirable to early Roman emperors, but Dalmatia was not completely subjugated by the Romans until 12 A.D., after 180 years of intermittent warfare. It has since been ruled by Croats, Serbs, Hungarians, Venetians, Turks, and Austrians.

Photograph by Maynard Owen Williams

CAMBODIA'S SPLENDID TEMPLES WERE STRANGLED BY TREES

The Kmer kings of seven centuries ago, whose successor took the Cambodian throne this year, built handsomely carved temples whose sculptures still preserve remnants of Kmer glory at Angkor Wat, for instance, and Ta Projm (above). But the prying above-ground roots of the hardy banyan tree have split apart the walls and scattered the stones, leaving isolated sections such as this carving of the snake god Naga. The Cambodian of today standing beside the handiwork of his ancestors guards a crumbling temple in the jungle with his obsolete cross-bow.